

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
4 November 2004 (04.11.2004)

PCT

(10) International Publication Number
WO 2004/095286 A3

(51) International Patent Classification⁷: **H04L 12/56**

(21) International Application Number:
PCT/US2004/012305

(22) International Filing Date: 21 April 2004 (21.04.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/464,462 22 April 2003 (22.04.2003) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

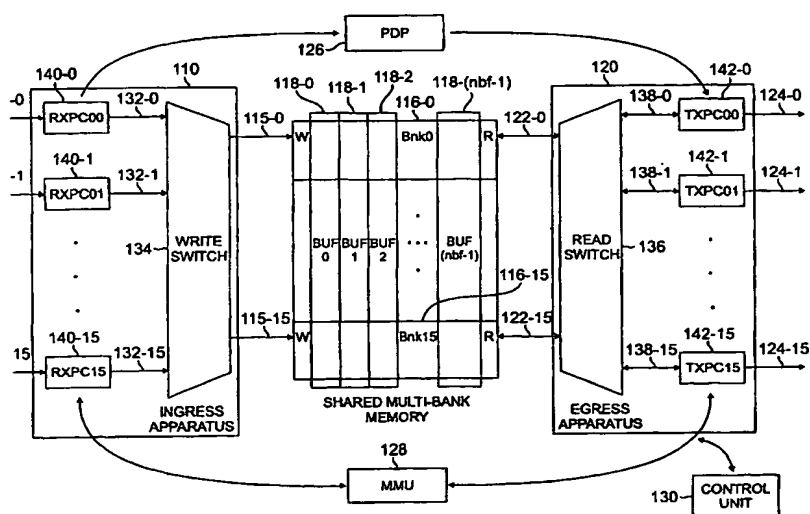
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

[Continued on next page]

(54) Title: METHOD AND APPARATUS FOR SHARED MULTI-BANK MEMORY IN A PACKET SWITCHING SYSTEM



(57) Abstract: A method and apparatus are disclosed that store sequential data units of a data packet received at an input port in contiguous banks of a buffer in a shared memory. Buffer memory utilization can be improved by storing multiple packets in a single buffer. For each buffer, a buffer usage count is stored that indicates the sum (over all packets represented in the buffer) of the number of output ports toward which each of the packets is destined. The buffer usage count provides a mechanism for determining when a buffer is free. The buffer usage count can also indicate a number of destination ports for a packet to perform a multicasting operation. Buffers can comprise one or more groups and each of the groups can comprise a plurality of banks.



(88) Date of publication of the international search report:
3 March 2005

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2004/012305

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04L12/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-------------------------------|
| X | US 2002/169921 A1 (SAITOH SATORU) 14 November 2002 (2002-11-14) paragraph [0023] paragraphs [0055] - [0062]; figure 1 paragraphs [0116] - [0119]; figure 6 ----- | 1-4,7,8, 18-21 |
| X | US 5 905 725 A (FERGUSON DENNIS C ET AL) 18 May 1999 (1999-05-18) column 4, lines 21-51; figure 2b column 5, line 54 - column 7, line 5; figure 5b column 8, line 33 - column 9, line 5; figure 9 ----- -/-- | 1,3-5,7, 8,18,20, 21,23 |

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"P" document published prior to the international filing date but later than the priority date claimed

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

14 October 2004

Date of mailing of the international search report

13. 01. 05

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/US2004/012305

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|---|-----------------------|
| A | <p>NARAGHI-POUR M ET AL: "A multiple shared memory switch" SYSTEM THEORY, 1996., PROCEEDINGS OF THE TWENTY-EIGHTH SOUTHEASTERN SYMPOSIUM ON BATON ROUGE, LA, USA 31 MARCH-2 APRIL 1996, LOS ALAMITOS, CA, USA, IEEE COMPUT. SOC, US, 31 March 1996 (1996-03-31), pages 50-54, XP010158641 ISBN: 0-8186-7352-4 the whole document</p> <p>-----</p> | <p>1-8, 18-24</p> |

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2004/012305

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of Item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-8, 18-24

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-8,18-24

Method and apparatus for storing packets in a shared memory packet switch comprising multiple memory banks. Packets are subdivided and stored to contiguous banks so as to provide parallel access when outputting the packet.

2. claims: 9-14

Method for managing memory in a shared memory switch. The memory is subdivided into buffers. A counter is maintained for each buffer to indicate usage of the buffer.

3. claims: 15-17

Method for detecting a lost buffer in a shared memory switch by maintaining free buffer lists and trace lists.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No.

PCT/US2004/012305

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
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